

## **Response**

### **A. Introduction**

Claims 1-12 were pending in the application prior to entry of the preceding amendments, and *claims 1-2 and 5-12* are pending now. The Examiner initially rejected:

1. Claims 1, 5, 9-10, and 12 under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 5,344,784 to Attridge;
2. Claims 1-2 and 5-7 under Section 102(b) as anticipated by U.S. Patent No. 5,478,755 to Attridge, et al.;
3. Claims 1-4 and 7-10 under Section 102(b) as anticipated by International Patent Publication No. WO 99/44042 of Singh, et al.; and
4. Claim 11 under 35 U.S.C. § 103(a) as obvious over the Attridge '784 patent.

In response to the Examiner's initial rejections, but without conceding the propriety thereof, Applicants have revised claim 1 to include selected features of prior claims 3-4 and 11 and other features of the invention not previously addressed in the claims. Applicants believe these revisions resolve the Examiner's concerns and accordingly request that the pending claims be allowed.

### **B. The Claims**

#### *1. Independent Claim 1*

As detailed in the application, depth of penetration of an evanescent field (optical mode) in a sensing layer may be controlled by the thickness or refractive index (or both) of an adjacent second layer capable of supporting a bulk optical mode. See Application at p. 5, ll. 5-11. Waveguide structures consistent with the invention are capable of producing such an evanescent field that overlaps at least a major

portion of a particle of diameter between 1-10  $\mu\text{m}$ . In the embodiment of FIG. 3, for example, a depth of penetration of about 1.5-2.0  $\mu\text{m}$  may be achieved. See id. at p. 14, ll. 1-7. This increased penetration results from providing a sensing layer disposed upon a second layer of low refractive index (*i.e.* 1.33-1.45) which is capable of supporting a bulk optical mode. Moreover, penetration is increased further when the refractive index of the second layer is lower than that of the third layer. See Application at p. 5, ll. 5-11.

Accordingly, the particle-detecting waveguide structure of amended independent claim 1 comprises:

- a second layer having refractive index of 1.33-1.45;
- a third layer having a higher refractive index than that of the second layer; and
- a sensing layer of a medium disposed on the second layer, the medium adapted to trap a target particle of diameter 1-10  $\mu\text{m}$ ;

with the structure being capable of supporting a bulk optical mode in the second layer. As further indicated in claim 1, when light is incident the upper surface of the third layer, the optical mode generated in the second layer penetrates into the sensing layer so as to overlap at least a major portion of the particle.

## *2. The Singh Publication*

The only reference cited against prior claim 4 is International Patent Publication No. WO 99/44042 of Singh, et al. Ignoring that layer 31 of the Singh publication is the designated sensing layer, the Examiner apparently contends that superstrate 30 is a “sensing” layer and sensing layer 31 is a “second” layer. See

Office Action at pp. 4-5. However, even were one to assume this defective reasoning of the Examiner to be correct, superstrate 30

- is *not* capable of sensing anything--much less particles; indeed, according to the table its refractive index is 1.0, suggesting the superstrate is either vacuum or air; and
- is *not* adapted, and is not capable of being adapted, to trap particles.

For at least this reason, therefore, no *prima facie* basis exists for rejecting either prior claim 4 or current claim 1.

Moreover, if the Examiner correctly credits layer 31 to be the “sensing” layer of the Singh publication, clear is that *no* second layer would exist (1) with refractive index between 1.33-1.45 or (2) capable of supporting a bulk optical mode therein. Additionally, *no* possible third layer would have a refractive index higher than that of such second layer, and *no* suggestion exists of generating an optical mode in any second layer so as to overlap at least a major portion of a particle having diameter of 1-10  $\mu\text{m}$ . Again, therefore, even under this theory no *prima facie* basis would be present for rejecting either prior claim 4 or current claim 1.

### *3. The Attridge ‘784 and ‘755 Patents*

Nor are any of these deficiencies cured by the Attridge ‘784 or ‘755 patents. The Attridge ‘784 patent, for example, discloses as a second layer materials having refractive index *substantially higher* than 1.45. See, e.g., Attridge ‘784 at col. 4, ll. 38-42 (mandating use of materials such as  $\text{SnO}_2$  [2.0] or  $\text{ZnS}$  [2.36] with high refractive indices). It additionally fails to contemplate having a third layer with refractive index higher than that of the second layer. The Attridge ‘755 patent

likewise teaches only second layers having refractive indices higher than 1.45, and both patents address detection of soluble analytes or fluorescence rather than detection of particles. Applicants accordingly request that, for at least the reasons discussed herein, claims 1-2 and 5-12 be allowed.

#### **Petition for Extension of Time**

Pursuant to 37 C.F.R. § 1.136(a), Applicants petition the Commissioner for all extensions of time needed to respond to the Office Action.

#### **Fees**

Attached is authorization to charge a credit card for \$460.00 for the petition fee. Applicants believe no other fee presently is due. However, if Applicants' belief is mistaken, the Commissioner is authorized to debit Deposit Account No. 11-0855 for any additional fee due as a consequence of Applicants' submission of this paper.

**Conclusion**

Applicants request that the Examiner allow claims 1-2 and 5-12 and that a patent containing these claims issue in due course.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Dean W. Russell".

Dean W. Russell  
Reg. No. 33,452  
Attorney for the Assignee

OF COUNSEL:

Kilpatrick Stockton LLP  
1100 Peachtree Street  
Suite 2800  
Atlanta, Georgia 30309  
(404) 815-6528